



Our ref.: 192065B

December 3, 2018

Stephen M. Jann, Chief
Underground Injection Control Branch
United States Environmental Protection Agency, Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

Subject: Information Request for Underground Injection Control (UIC) Permit Application Nos MI-163-11-0004, 0005, 0006, 0007 and 0008 for Five Class I Non- Hazardous Permits, Dated September 5, 2018 and Underground Injection Control (UIC) Permit Application No. MI-163-3A-0001 Dated October 2, 2018

Dear Sir:

On behalf of Buckeye Terminals, LLC, WSP USA has incorporated revisions to the above mentioned permit application in response to EPA's above cited letters dated September 5, 2018 and October 2, 2018. The updates are detailed in the table below. Enclosed are replacement pages (two sets) for Buckeye Terminals, LLC "Class I Non-Hazardous UIC Permit Application for Proposed BDW-1 through -5 Woodhaven Terminal, Wayne County, Michigan.

1. Hydrostatic analysis of the injection zone while under the effects of the proposed injection project.

The permit applications identified the W.E. Ellis well as located within the Area of Review of the proposed Buckeye disposal wells and it penetrates the primary confining zone (Utica Shale). This well was drilled in 1924 and it appears that no records exist of well construction or plugging. Absent these records, EPA identifies this well as an open conduit through the primary confining zone. EPA requests that Buckeye perform pressure analysis of the proposed injection zone that will predict the hydrostatic head within the W. E. Ellis well while under the maximum injection conditions of the 5 proposed injection wells and the Marathon Pipe Line, LLC, Class II injection well (EPA permit #MI-163-2D-0001). If the analysis identifies that the hydrostatic head will rise to the lowest identified underground source of drinking water (USDW), Buckeye can demonstrate the effect of restrictions that may lower the hydrostatic head in the W.E. Ellis well. These restrictions include, but are not limited to: variation of injection pressures and/or volumes in the 5 proposed injection wells, and the confining influence of the Trenton/Black River group on fluid movement and pressure.

This analysis must identify all assumptions used and explanations and documentation that support all geologic characteristics used in the analysis. Distances from the location of any geologic samples used in the analysis to the Buckeye project area and the W.E. Ellis well must be identified.

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Response:

The GeoWebface database indicates W. E. Willis as a dry and abandoned well within the 2-mile area of review. This well was drilled and completed in 1927. Well completion details were not identified in the well record; however, a plugging record was obtained. This plug and abandonment record shows no cement plug, but only mud plug of unknown weight. The available Drillers Log indicated the well was drilled to a depth of 2,820 feet in Trenton Dolomite and Black River formations. At later stage the well was deepened to 3,055 feet depth for which there is no drillers log record or any other information. It appears this well might have been drilled to the bottom of the Black River Formation for exploration purposes. Since there is no cement plug between the USDW and the injection zone, Buckeye has decided to relocate the bottom-hole location BDW-2, BDW-3, and surface and bottom-hole location for BDW-5 as shown on the Figure A-1.

2. Description of the automatic specific gravity monitoring system and its interface with the adjustment of the maximum injection pressure for each of the proposed 5 injection wells.

Response:

Continuous or periodic monitoring devices will be installed, used, and maintained in proper operating condition to monitor injection fluid pH, specific gravity, temperature of the injection fluid. The measuring devices will be installed in the flow line prior to injection at the sampling port and measure the respective parameters pH, temperature and specific gravity, while in operation. This measured data will directly input in to the computer system. The computer is installed with a software like Supervisory Control and Data Acquisition (SCADA) or any similar software that receives and processes the obtained data and sends instruction to the injecting system. Now depending on the specific gravity value measured the program will allow the injection pressure as tabulated in Attachment H, Section H.2. The injection pressure is based on the specific gravity of the fluid. If the fluid has specific gravity is either lower or higher than in the table in Section H.2, the system will automatically shut down or the alarm will ring and the technical person on the job will immediately shut down the injection system and take necessary measures.

3. Clarification of the type and function of the 4 wells identified in the permit application as "freshwater" wells owned by Marathon Oil Company and drilled to depths between 1142 and 1156 feet.

Response:

Buckeye rechecked the above-mentioned Marathons freshwater wells closely. These wells are listed in the water well data base (Welllogic WaterWells) of MDEQ. These wells are Marathons Storage Cavern Wells. For clarification within the application, these four wells were removed from the Freshwater Well Map (Figure 1) and the Freshwater well Table A-2. The 2-mile Freshwater well search was updated to 12 wells have been shown on the Topographic Map B-1. The freshwater Well Table A-1 is updated with the additional wells.

4. Results from Buckeye's investigation, if performed, into the existence or absence of properties listed or eligible for listing on the National Register of Historic Places.

Response:

An application for Section 106 Review has been submitted to the State Historic Preservation Office, cultural Resources Management and Planning Section. The report will be submitted to EPA as soon as received.



EPA Letter, Dated October 2, 2018

Re: Underground Injection Control (UIC) Permit Application No. MI-163-3A-0001

Item 1: The existing latitude and longitude coordinates provided do not map correctly and would be located far outside of the State of Michigan. Please submit updated and corrected latitude and longitude coordinates for each of the four proposed cavern wells. See 40 CFR §144.31 and §146.34(a).

Response:

The Latitude and Longitude of the well locations have been corrected and updated in the Form 7520-6 Application Form.

Item 2: The existing wellbore schematic diagrams M-1 and Appendix B, Page 7 do not provide information regarding the class and number of sacks of cement to be used for cement to the surface between well casings. This information must be provided to facilitate EPA review and evaluation of the technical adequacy of the well design. Please submit updated well bore schematic diagrams containing the additional cement information. See 40 CFR §146.32(a)(7).

Response:

The Wellbore Schematics for BDW-1 through BDW-5 have been updated with the estimated amount of cement that will be needed to for completion. The estimated cement volumes are estimated for 20% more than the wellbore diameter.

Please use the enclosed table for the subsequent attachments as a guide to replace sections for the Permit Application for the Class I Non-Hazardous Injection UIC Permit Application for Proposed BDW-1 through -5.

Kind regards,

A handwritten signature in black ink, appearing to read 'Brandon Schulte'.

Brandon Schulte, PE
Mgr. Permitting & Well Integrity

BS/bs

Encl.

cc: Brian R. Bell, Vice President, Buckeye Development and Logistics, Buckeye Terminals LLC. One Way Plaza, Houston Texas

REMOVE FROM EXISTING APPLICATION	REPLACE WITH ENCLOSED DOCUMENTS	COMMENT
Cover page	Cover page	Replace in both copies
EPA 7520-6 Application form	EPA 7520-6 Application form	Replace BDW-2, BDW-3, BDW-5
Table of Contents	Table of Contents	Replace complete Table of Contents.
Attachment A: Area of Review	A. Area of Review	Replace complete section
Attachment B: Maps of Wells and Area of Review	B. Maps of Wells (Area of Review) Figures Tables	Replace complete section incl. figures and tables. Updates were made to text Tables and Figures
Attachment C: Corrective Action Plan	C. Corrective Action Plan and Well Data	Revised, replace with complete section
Attachment H: Operating Data	H. Operating Data Complete Section including tables.	Changes are in Section H.2 only
Appendix B (Attachment C)	Remove	Remove
Figure M1, M2, M3, M4 and M5	Figure M1, M2, M3, M4 and M5 Replace	Updated with Cement Details
Figure Q-1, and Q-2	Figure Q-1 and Q-2 Replace	Updated with Cement Details

BUCKEYE TERMINALS, LLC

CLASS I NON-HAZARDOUS PERMIT APPLICATION FOR PROPOSED BDW-1 THROUGH BDW-5

WOODHAVEN TERMINAL, WAYNE COUNTY, MICHIGAN

NOVEMBER 29, 2018





CLASS I NON-HAZARDOUS PERMIT APPLICATION FOR PROPOSED BDW-1 THROUGH BDW-5

WOODHAVEN TERMINAL,
WAYNE COUNTY, MICHIGAN

BUCKEYE TERMINALS, LLC

PROJECT NO.: 192065A
DATE: NOVEMBER 2018

WSP USA
SUITE 200
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- E EPA PLUGGING AND ABANDONMENT PLAN - EPA FORM
7540-14 (SEE ATTACHMENT Q)

ACRONYMS

AB-LOC	Abandoned Location
AOR	Area of Review
bbls	barrels
bgs	below ground surface
BHA	Bottom Hole Assembly
BOP	Blowout Preventer
BWOC	Percent of material added to cement
BWOW	Percent of a material added to a cement slurry based on the weight of water
CESQG	Conditionally Exempt Small Quantity Generator
cf/sk	cubic foot per sack
D&A	Dry and Abandoned
EIS	Emissions Inventory System
EPA	Environmental Protection Agency - Region 5
gal/sk	gallons per sack
gpm	gallons per minute
GSTG	Liquified Petroleum Gas Storage - Active
LCM	Solid material introduced into a mud system
md	millidarcy
MD	measured depth
MDEQ	Michigan Department of Environmental Quality
mg/L	milligram per liter
MIT	Mechanical Integrity Test
NPDES	National Pollutant Discharge Elimination System
PPF	pounds per foot
ppg	pounds per gallon
psi	pound per square inch
psi/ft	pound per square inch per foot
psig	pounds per square inch gauge
RCRA	Resource Conservation and Recovery Act
SWDOP	Liquified Petroleum Gas Storage - Plugging Approved
SWPPP	Stormwater Pollution Prevention Plan

TD	Total Depth
TDS	Total Dissolved Solids
TSDF	Hazardous Waste Treatment, Storage, or Disposal Facilities
TVD	Total Vertical Depth
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water

INSERT for EPA Form 7520-6

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 United States Environmental Protection Agency Underground Injection Control Permit Application <i>(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)</i>		I. EPA ID Number		
			T/A C	
Read Attached Instructions Before Starting For Official Use Only				
Application approved mo day year	Date received mo day year	Permit Number	Well ID	FINDS Number
II. Owner Name and Address		III. Operator Name and Address		
Owner Name Buckeye Terminals, LLC		Owner Name Buckeye Terminals, LLC		
Street Address One Greenway Plaza		Street Address 20755 West Road		Phone Number
City Houston		State TX	ZIP CODE 77046	City Woodhaven
		State MI	ZIP CODE 48483	
IV. Commercial Facility	V. Ownership	VI. Legal Contact	VII. SIC Codes	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> Private <input type="checkbox"/> Federal <input type="checkbox"/> Other	<input type="checkbox"/> Owner <input type="checkbox"/> Operator	4226	
VIII. Well Status (Mark "x")				
<input type="checkbox"/> A Operating	Date Started mo day year	<input type="checkbox"/> B. Modification/Conversion	<input checked="" type="checkbox"/> C. Proposed	
IX. Type of Permit Requested (Mark "x" and specify if required)				
<input checked="" type="checkbox"/> A. Individual	<input type="checkbox"/> B. Area	Number of Existing Wells 0	Number of Proposed Wells 1	Name(s) of field(s) or project(s) BDW-3
X. Class and Type of Well (see reverse)				
A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain		D. Number of wells per type (if area permit)
I	I			
XI. Location of Well(s) or Approximate Center of Field or Project				XII. Indian Lands (Mark 'x')
Latitude		Longitude		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Deg Min Sec	Deg Min Sec	Township and Range		
42 8 5.27	83 14 8.65	22 04S 10E	1/4 Sec NE	
XIII. Attachments				
(Complete the following questions on a separate sheet(s) and number accordingly; see instructions) For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.				
XIV. Certification				
I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)				
A. Name and Title (Type or Print) Carl A. Ostach, VP Domestic Field Operations			B. Phone No. (Area Code and No.) (610) 904-4262	
C. Signature 			D. Date Signed 11/05/18	

INSERT for EPA Form 7520-6

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Street Address One Greenway Plaza		Street Address 20755 West Road												
Phone Number (832) 214-6026		Phone Number												
City Houston	State TX	ZIP CODE 77046	City Woodhaven	State MI										
				ZIP CODE 48483										
IV. Commercial Facility		V. Ownership		VI. Legal Contact										
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IX. Type of Permit Requested (Mark "x" and specify if required)														
<input checked="" type="checkbox"/> A. Individual	<input type="checkbox"/> B. Area	Number of Existing Wells 0	Number of Proposed Wells 1	Name(s) of field(s) or project(s) BDW-5										
X. Class and Type of Well (see reverse)														
A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain		D. Number of wells per type (if area permit)										
1	1													
XI. Location of Well(s) or Approximate Center of Field or Project				XII. Indian Lands (Mark 'x')										
Latitude		Longitude		Township and Range										<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Deg	Min	Sec	Deg	Min	Sec	Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line	
42	8	12.9	83	13	49.2	22	04S	10E	NE					
XIII. Attachments														
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A. Name and Title (Type or Print)										B. Phone No. (Area Code and No.)				
Carl A. Ostach, VP Domestic Field Operations										(610) 904-4262				
C. Signature										D. Date Signed				
										11/05/18				

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VI. Legal Contact		VII. SIC Codes		
<input checked="" type="checkbox"/> Owner <input type="checkbox"/> Operator		4226		
VIII. Well Status (Mark "x")				
<input type="checkbox"/> A. Operating Date Started mo day year		<input type="checkbox"/> B. Modification/Conversion <input checked="" type="checkbox"/> C. Proposed		
IX. Type of Permit Requested (Mark "x" and specify if required)				
<input checked="" type="checkbox"/> A. Individual <input type="checkbox"/> B. Area		Number of Existing Wells 0		
		Number of Proposed Wells 1		
		Name(s) of field(s) or project(s) BDW-2		
X. Class and Type of Well (see reverse)				
A. Class(es) (enter code(s))		B. Type(s) (enter code(s))		
I		I		
C. If class is "other" or type is code 'x,' explain		D. Number of wells per type (if area permit)		
XI. Location of Well(s) or Approximate Center of Field or Project			XII. Indian Lands (Mark 'x')	
Latitude Deg Min Sec Deg Min Sec Township and Range 42 8 17.2 83 14 8.51 22 04S 10E 1/4 Sec NE Feet From Line Feet From Line			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
XIII. Attachments				
(Complete the following questions on a separate sheet(s) and number accordingly; see instructions) For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.				
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A. Name and Title (Type or Print) Carl A. Ostach, VP Domestic Field Operations		B. Phone No. (Area Code and No.) (610) 904-4262		
C. Signature 		D. Date Signed 11/05/18		

A. AREA OF REVIEW

Buckeye Terminals, LLC Woodhaven Terminal is located in south-central Wayne County, Michigan, approximately 15 miles southwest of the city of Detroit. Five injection wells are proposed to be installed at this terminal. BDW-1 and BDW-4 are vertical wells and BDW-2, BDW-3, and BDW-5 are directional as shown on Figure A-1.

The Area of Review (AOR) is the area surrounding an injection well that is set at a minimum fixed radius of 2 miles for non-hazardous wells. Well data available from public records within the AOR are tabulated in Table A-1 (non-freshwater) and Table A-2 (freshwater). Twenty-two (22) non-freshwater wells and thirteen freshwater wells were identified within the AOR. The non-freshwater wells include:

- Active liquefied petroleum gas storage – 8 wells;
- Gas storage (plugging approved) - 8 wells;
- Brine disposal - 1 well (active);
- Dry and abandoned - 3 wells; and
- Abandoned locations – 2 wells.

The above wells include active storage caverns at the site operated by Marathon Oil Co. (five storage caverns, one disposal well, and three brine recovery wells). The storage caverns at the site formerly operated by Phillips Petroleum Co. (two caverns and one brine disposal well) and Mobil Oil Co. (four caverns and two brine disposal wells), but have since been plugged and abandoned.

Only one well intercepts the injection zone in the area of review. Well API #21163001468000 is an active salt water disposal well operated by Marathon Pipe Line LLC (original operator Marathon Oil Co). A geophysical log recorded downhole in Well API #21163001468000 is shown on the cross section provided on Figures F-4 and F-5 in Attachment F. As demonstrated in Attachment C, no corrective action is necessary for this site.

Surrounding wells, with the exception of shallow monitoring wells and borings, are shown on the map provided in Attachment B.

List of Tables in Attachment A

Table A-1	Non-Freshwater (Oil and Gas) Wells in Area of Review
Table A-2	Freshwater Wells in 2-Mile Area of Review

Table A-1 Non-Freshwater (Oil and Gas) Wells in Area of Review

TABLE A-1
NON-FRESHWATER (OIL AND GAS) WELLS IN AREA OF REVIEW
BUCKEYE TERMINAL, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

Map ID	API	Township-Range-Section	Footage	Lease Name	Well Num	Current Operator	Status and Type	Drill Date	Depth (feet)
1	2116324850	4S 10E 10	487 FNL 1065 FEL CONGRESS SECTION	PHILLIPS PETROLEUM CO	1	PHILLIPS PETRLM CO	D&A	1963-08-14	1315
2	2116300135	4S 10E 10	735 FNL 1065 FEL CONGRESS SECTION	PHILLIPS PETROLEUM COMPANY	BD-2	PHILLIPS PETRLM CO	AB-LOC		
3	2116324851	4S 10E 10	992 FNL 1065 FEL CONGRESS SECTION	PHILLIPS PETROLEUM CO	2	PHILLIPS PETRLM CO	D&A	1963-09-03	1315
4	2116327160	4S 10E 22	525 FNL 143 FEL CONGRESS SECTION	MARATHON OIL LPG	1	MARATHON PIPELINE CO	GSTG	1968-04-11	1156
5	2116323775	4S 10E 22	1470 FNL 120 FEL CONGRESS SECTION	SOCONY-MOBIL OIL	3-A	MOBIL OIL CORP	SWDOP	1961-12-14	1158
6	2116323776	4S 10E 22	1570 FNL 120 FEL CONGRESS SECTION	SOCONY-MOBIL OIL	3-B	MOBIL OIL CORP	SWDOP	1961-12-29	1150
7	2116323673	4S 10E 22	1500 FNL 660 FEL CONGRESS SECTION	FEE	1	MOBIL OIL CORP	SWDOP	1961-10-17	1162
8	2116323774	4S 10E 22	1800 FNL 660 FEL CONGRESS SECTION	SOCONY-MOBIL	2	MOBIL OIL CORP	SWDOP	1962-02-01	1148
9	2116300145	4S 10E 22	1918 FNL 356 FEL CONGRESS QTR	MOBIL OIL CORPORATION	BD2	MOBIL OIL CORP	SWDOP	1967-11-01	365
10	2116323777	4S 10E 22	1870 FNL 120 FEL CONGRESS SECTION	SOCONY-MOBIL	4-A	MOBIL OIL CORP	SWDOP	1962-01-09	1147
11	2116300133	4S 10E 22	1895 FNL 120 FEL CONGRESS SECTION	SOCONY-MOBIL OIL	BD-1	MOBIL OIL CORP	SWDOP	1962-01-18	330
12	2116323778	4S 10E 22	1970 FNL 12 FEL CONGRESS SECTION	SOCONY-MOBIL OIL	4-B	MOBIL OIL CORP	SWDOP	1962-01-24	1162
13	2116300146	4S 10E 22	561 FNL 342 FEL CONGRESS QTR	FEE	BD-1	MARATHON PIPELINE CO	Brine Disposal	12/12/1968	3745
14	2116327161	4S 10E 22	525 FNL 629 FEL CONGRESS QTR	MARATHON OIL LPG	2	MARATHON PIPELINE CO	GSTG	1968-03-12	1154
15	2116328435	4S 10E 22	1580 FSL 204 FEL CONGRESS SECTION	MARATHON OIL CO	BR-1	MARATHON PIPELINE CO	GSTG	1971-07-08	1150
16	2116327162	4S 10E 22	781 FNL 341 FEL CONGRESS QTR	MARATHON OIL LPG	4	MARATHON PIPELINE CO	GSTG	1968-02-14	1154
17	2116331007	4S 10E 22	1186 FNL 670 FEL CONGRESS QTR	MARATHON OIL COMPANY BR	BR-2	MARATHON PIPELINE CO	AB-LOC		
18	2116327980	4S 10E 22	781 FNL 1314 FEL CONGRESS QTR	MARATHON OIL LPG	6	MARATHON PIPELINE CO	GSTG	1970-05-27	1165
19	2116332882	4S 10E 22	1165 FNL 709 FEL CONGRESS QTR	MARATHON OIL CO	2	MARATHON PIPELINE CO	GSTG	1979-07-11	1158
20	2116332883	4S 10E 22	1135 FNL 1158 FEL CONGRESS QTR	MARATHON OIL CO	BR-3	MARATHON PIPELINE CO	GSTG	1979-06-13	1130
21	2116327528	4S 10E 22	785 FNL 823 FEL CONGRESS QTR	FEE	5	MARATHON PIPELINE CO	GSTG	1969-01-31	1155
22	2116357361	4S 10E 22	990 FSL 1070 FEL CONGRESS SECTION	WOODHAVEN WELL	3	MARATHON PIPELINE CO	D&A	2005-12-01	1244

Note:

D&A = Dry and Abandoned

AB-LOC = Abandoned Location

GSTG - Liquified Petroleum Gas Storage - Active

SWDOP - Gas Storage - Plugging Approved

Brine Disposal- SWD Active

Table A-2 Freshwater Wells in 2-Mile Area of Review

TABLE A-2
FRESHWATER WELLS WITHIN 2 MILE AREA OF REVIEW
BUCKEYE TERMINAL, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

Sl. No	WELL ID	COUNTY	TOWN	RANGE	SECTION	OWNER_NAME	WELL_ADDR	WELL_DEPTH	WELL_TYPE	WEL_STATUS	CONST_DATE	LATITUDE	LONGITUDE
1	82000001589	Wayne	04S	10E	10	PHILLIPS PETROLEUM CO.	ION	353	OTH			42.16657275	-83.23097822
2	82000001590	Wayne	04S	10E	10	PHILLIPS PETROLEUM CO.		353	OTH			42.16792154	-83.23106906
3	82000001591	Wayne	04S	10E	10	PHILLIPS PETROLEUM CO.		353	OTH			42.16877497	-83.23112755
4	82000001600	Wayne	04S	10E	20	2001 NURSERY	24355 TELEGRAPH RD	168	IRRI		8/2/1987	42.12864357	-83.27207053
5	82000001601	Wayne	04S	10E	20	2001 NURSERY	24355 TELEGRAPH	146	IRRI		7/2/1979	42.12822672	-83.27226054
6	82000001602	Wayne	04S	10E	20	HAROLD HALT	24794 STREWING	146	HOSHLD		8/18/1980	42.12521996	-83.27220499
7	82000001606	Wayne	04S	10E	22	MOBIL OIL CO.		365	OTH		11/14/1967	42.13530271	-83.22749218
8	82000001612	Wayne	04S	10E	28	INTER-LAKES REFINERIES INC.		155	OTH			42.11558383	-83.2639169
9	82000001613	Wayne	04S	10E	28	INTER-LAKES REFINERIES		125	OTH			42.11554175	-83.26334726
10	82000002105	Wayne	04S	10E	10	CORRPRO INC	20384 King Rd	175	OTH	ACT	10/7/2004	42.1543787	-83.245232
11	82000002254	Wayne	04S	10E	29	WOODHAVEN HIGH SCHOOL	24787 VAN HORN	252	IRRI	ACT	8/30/2005	42.12168	-83.26905
12	82000002522	Wayne	04S	10E	18	DOWNRIVER SOCCER ORG.	23156 KING ROAD	160	IRRI	ACT	11/8/2011	42.15607	-83.257
13	82000002835	Wayne	04S	10E	20	RAUPP BROTHERS, INC.	23216 TELEGRAPH RD.	200	IRRI	ACT	4/3/2017	42.136372	-83.268349

Figure A-1 Proposed Cavern and Brine Disposal Well Locations, Buckeye Terminals, LLC



- Legend**
- Proposed BDW Well Location
 - Cavern_Wells
 - Proposed BDW Directional
 - Property Boundary Buckeye
 - Proposed BDW Pad
 - Proposed Cavern Well
 - Proposed Cavern Well Pad
 - Michigan PLSS QQ Sections

Well Locations	Latitude NAD 27			Longitude NAD 27		
Well Name	Deg	Min	Sec	Deg	Min	Sec
BDW-1	42	8	19.77	83	13	58.46
BDW-2	42	8	19.37	83	13	58.38
BDW -2 (bottom)	42	8	17.16	83	14	8.52
BDW-3	42	8	9.28	83	13	56.72
BDW -3 (bottom)	42	8	5.27	83	14	8.65
BDW-4	42	8	9.83	83	13	56.87
BDW- 5	42	8	19.87	83	13	55.42
BDW-5 (bottom)	42	8	12.92	83	13	49.22



Figure A-1
Proposed Cavern Well and Disposal Well Locations
Buckeye Terminals, LLC

B. MAPS OF WELLS (AREA OF REVIEW)

B.1 MAPS

Figure B-1 was prepared using a compilation of USGS 7 ½ minute series topographic quadrangle maps: Flat Rock NE, MI; Wyandotte, MI, ON; Flat Rock, MI; and Rockwood, MI. This figure shows the proposed injection well locations, the property boundary, the AOR for the proposed injection wells, surface features, and one listed Hazardous Waste Treatment, Storage, or Disposal Facilities (TSDF) (see Attachment B.3). There are no known faults within the AOR.

Figure B-2 illustrates the property boundary, the AOR boundary, freshwater and non-freshwater penetrations, and cross section line locations for regional cross sections provided in Attachment F.

B.2 ADJACENT LANDOWNERS

Table B-1 is a list of property landowners that are within ¼ mile radius of the proposed injection well locations (Figure B-3).

B.3 HAZARDOUS WASTE TREATMENT, STORAGE, OR DISPOSAL FACILITIES (TSDF)

A search of the TSDF in the vicinity of the Woodhaven Terminal was conducted using the EPA Enforcement and Compliance History Online Facility Search (2017). One TSDF is located within the AOR as shown on Figure B-1:

1 Solutia Inc. (Resource Conservation and Recovery Act [RCRA] ID: MID009708678)
5045 W. Jefferson Ave.
Trenton, MI
Current Compliance Status: Noncompliance
Designation: Conditionally Exempt Small Quantity Generator (CESQG)

B.4 PROTOCOL FOR IDENTIFYING WELLS

B.4.1 NON-FRESHWATER RECORDS

Records for oil and gas wells in the state of Michigan are maintained by the Mineral Wells Division of the Michigan Department of Environmental Quality (MDEQ), which is the primary regulatory agency that enforces compliance with oil and gas rules and regulations. Well permits, completions, and pluggings filed with this agency are maintained by county, township, range and section number.

Information on non-freshwater wells located in the AOR was reviewed. Well data available from public records within the AOR for non-freshwater wells are tabulated in Table A-1. Twenty-two (22) non-freshwater wells were identified within the AOR. The non-freshwater wells include:

- Active liquefied petroleum gas storage – 8 wells;
- Gas storage (plugging approved) - 8 wells;

- Brine disposal - 1 well;
- Dry and abandoned - 3 wells; and
- Abandoned locations – 2 wells.

The above wells include active storage caverns near the site formerly operated by Marathon Oil Co. (five storage caverns, one disposal well, and three brine recovery wells). The storage caverns near the site operated by Phillips Petroleum Co. (two caverns and one brine disposal well) and Mobil Oil Co. (four caverns and two brine disposal wells) were previously operated, but have since been plugged and abandoned. The locations of these wells are indicated on Figure B-2.

Well API # 21163001468000 is an active salt water disposal well, operated by Marathon Oil Co.

B.4.2 FRESHWATER RECORDS

Water well records available for the State of Michigan are maintained by the MDEQ – Water Bureau. The filing system used is referenced by section, township, and range. Well data available from public records for freshwater wells within the AOR are tabulated in Table A-2. Thirteen freshwater wells are listed and indicated on Figure B-1. The water well depths varies from 125 feet to 365 feet within the area of review.

List of Tables in Attachment B

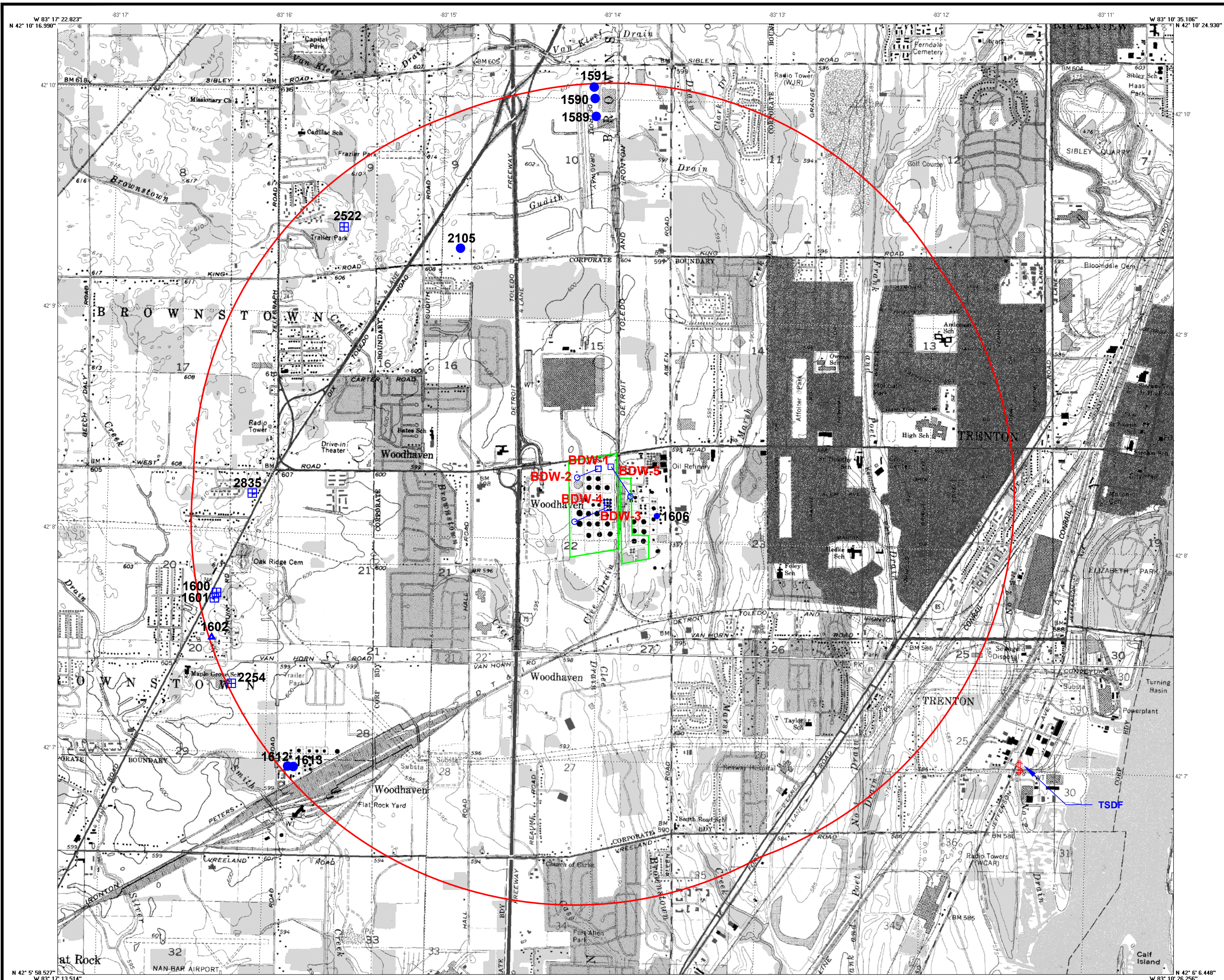
Table B-1 Adjacent Landowners List

List of Figures in Attachment B

Figure B-1	Topographic Map of Area of Review
Figure B-2	Area of Review Map
Figure B-3	Property Owner Map

Table B-1 Adjacent Landowners List

Figure B-1 Topographic Map of Area of Review



W 83° 17' 22.823" N 42° 10' 16.990"

W 83° 10' 35.106" N 42° 10' 24.930"

W 83° 17' 13.514" N 42° 5' 58.527"

W 83° 10' 26.256" N 42° 6' 4.448"

Maps Compiled from USGS Quads:
Flat Rock NE, MI
Wyandotte, MI, ON
Flat Rock, MI
Rockwood, MI

NOTE: A search of the TSDf in the vicinity of the Buckeye Woodhaven Terminal was conducted using the EPA Enforcement and Compliance History Online Facility Search (2017). One TSDf is located within the AOR as shown on Figure B-xx:

1. Solitia Inc. (RCRA ID: MID009708678)
5045 W. Jefferson Ave.
Trenton, MI
Current Compliance Status: Noncompliance

Designation: Conditionally Exempt Small Quantity Generator (CESQG)

LEGEND:

- OTHER WELLS
- PROPOSED BRINE SOLUTION WELLS SURFACE HOLE LOCATIONS
- BOTTOMHOLE LOCATIONS
- IRRIGATION WELLS
- HOUSEHOLD WELLS
- 2-MILE COMBINED RADIUS AROUND WELLS
- PROPERTY BOUNDARY

ROAD CLASSIFICATION

- Heavy-duty
- Medium-duty
- Light-duty
- Unimproved dirt
- Interstate Route
- U.S. Route

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

WSP

WSP USA INC.
16200 Park Row Ste. 200
Houston, TX 77084
TEL: (281) 589-5900

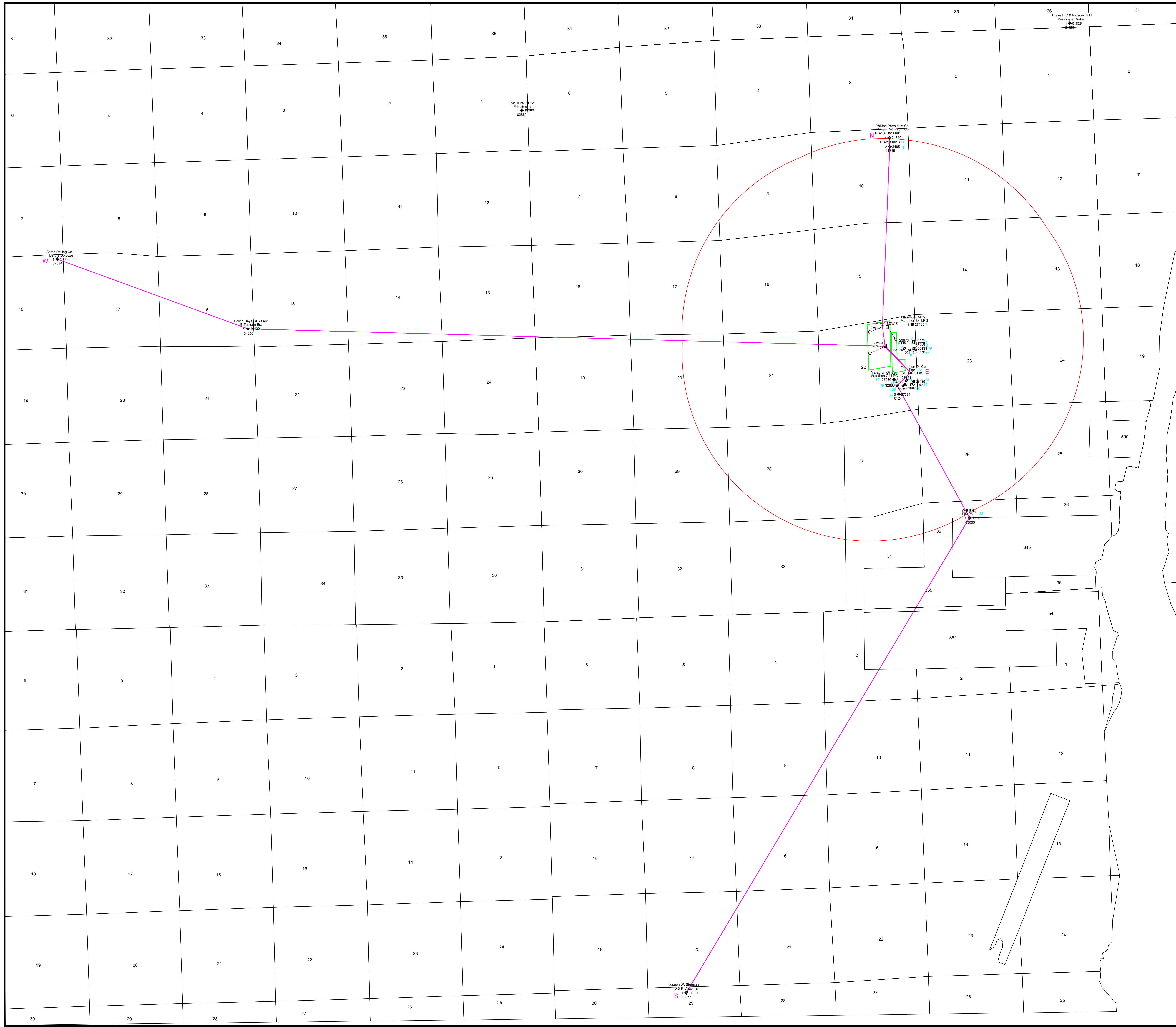
FIGURE B-1

BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

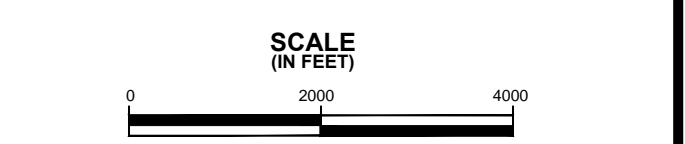
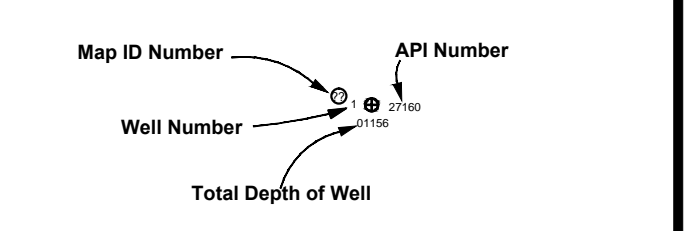
TOPOGRAPHIC MAP OF AREA OF REVIEW

DATE: 11/20/18 CHECKED BY: JOB NO.: 192065B
DRAWN BY: WDD APPROVED BY: DWG NO.:

Figure B-2 Area of Review Map



- LEGEND**
- ◆ DRY HOLE
 - ◆ DRY HOLE - OIL
 - ◆ DRY HOLE - OIL & GAS
 - GAS STORAGE
 - ⊠ SALTWATER DISPOSAL - INJECTION
 - × ABANDONED LOCATION
 - PROPOSED SURFACE LOCATION
 - BOTTOMHOLE LOCATION
 - COMBINED 2-MILE AREA OF REVIEW
 - LINES OF CROSS SECTION
 - BUCKEYE PROPERTY BOUNDARY



WSP WSP USA Inc.
16200 Park Row Ste 200
Houston, Texas 77064
TEL: (281) 558-5900

FIGURE B-2

BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

AREA OF REVIEW MAP

DATE: 11/19/18	CHECKED BY: RFP	JOB NO: 1020508
DRAWN BY: WSD	APPROVED BY: WSD	SHEET NO: 20/25

Figure B-3 Property Owner Map

C. CORRECTIVE ACTION PLAN AND WELL DATA

The AOR, as discussed in Attachment A, is set at a minimum fixed radius of 2-miles for non-hazardous Class 1 wells. Well data available from public records within the AOR are tabulated in Table A-1 (non-freshwater) and Table A-2 (freshwater). Twenty-two (22) non-freshwater wells and 13 freshwater wells were identified within the 2-mile AOR. Surrounding wells, with the exception of shallow monitoring wells and borings, are shown on the map provided in Attachment B.

There is one well within the AOR that penetrates the injection zone. The details of the well are listed in Table C-1. The Well API # 21163001468000 is an active salt water disposal well (Marathon Oil Co. (Woodhaven) BD-1) operated by Marathon Pipe Line LLC (original operator Marathon Oil Co). According to the well construction and the plugging and abandonment plan, the well was constructed to be protective of the USDW and to withstand injection pressure from outside pressures. The surface and intermediate casings are cemented to the surface. Not enough well record is available in public record except the information on the GeoWebFace of MDEQ. The available information for this well are included in Appendix B.

Therefore, no corrective action is necessary for this site.

Table C-1 Wells Within the AOR Penetrating the Top of the Confining Zone

API # 21163001468000

PERMIT #416

MARATHON OIL COMPANY

Date of Construction	December 12, 1968
Total Depth (feet)	3,745
Well Construction	Vertical
Cement Records	Unavailable
Plugging Records	Unavailable
Well Status	Active
Distance from Nearest Proposed Well	Approximately 1,260 feet

H. OPERATING DATA

H.1 INJECTION RATE AND VOLUME

The estimated average injection rate is: 165 gallons per minute (gpm) for each well.

The estimated average injection volume is: 7,128,000 gallons per month (30 days) per well for each well.

The requested maximum injection rate is: 215 gpm for each well.

The requested maximum injection volume is: 9,288,000 gallons per month (30 days) for each well.

The estimated average injection rate is based on measured injection rates in nearby wells injecting into the Mt. Simon Formation.

H.2 INJECTION PRESSURES

Based on the following calculations, the requested maximum surface pressure (MASIP) for variable specific gravities are as follows:

$[(0.80 \text{ pound per square inch per foot [psi/ft]} - (0.433 \text{ psi/ft} \times \text{specific gravity})) \times \text{depth}] - 14.7 \text{ pounds per square inch gauge (psig)}$

$[(0.80 \text{ psi/ft} - (0.433 \text{ psi/ft} \times 1.00)) \times 3,470] - 14.7 \text{ psi} = 1,259 \text{ psig}$

Where: Specific Gravity = 1.00

Depth to top of the Mt. Simon Formation = 3,470 feet

Fracture Gradient = 0.80 psi/ft

$[(0.80 \text{ psi/ft} - (0.433 \text{ psi/ft} \times 1.21)) \times 3,470] - 14.7 \text{ psi} = 943 \text{ psig}$

Where: Specific Gravity = 1.21

Depth to top of the Mt. Simon Formation = 3,470 feet

Fracture Gradient = 0.80 psi/ft

A table of MASIP as a function of Specific Gravity is provided in Table H-1.

Continuous monitoring devices will be installed or periodic fluid sampling will be carried out analyzed and maintained in proper operating condition to monitor injection fluid specific gravity, temperature of the injection fluid. The measuring devices will be installed in the flow line at the sampling point before injection and measure the respective parameters pH, temperature and Specific Gravity, while in operation. This measured data will directly or manually input in to the computer system. The computer is installed with a software like Supervisory Control and Data Acquisition (SCADA) or any similar software that receives the analytical data. Now depending on the specific gravity measured value the program will allow the injection pressure as tabulated below. The injection pressure is based on the specific gravity of the fluid. If the injecting fluid has specific gravity either lower or higher than as in the table, the system will automatically shut down or the alarm system will alert and the technical person on the job will immediately shut down the injection system.

Table H-1 **MASIP as a Function of Injectate Specific Gravity**

INJECTATE SPECIFIC GRAFIVTY	MASIP (PSIG)
1.00	1259
1.05	1184
1.10	1109
1.15	1033
1.20	958
1.21	943

H.3 WASTE

H.3.1 SOURCE

The proposed injectate will consist of brine from the solution mining of the Salina Formation to create storage caverns. The specific gravity of the brine is expected to range from 1.00 to 1.21. The injectate pH will be approximately 7.24 at 70 F°.

H.3.2 WASTE ANALYSIS

A typical Wastewater analysis is provided in Table H-2 and as Table 1-1 in Appendix D, the Waste Analysis Plan discussed in Attachment P.

H.3.3 CORROSION MONITORING

The corrosivity of the wastewater injectate will be monitored with corrosion coupons placed in the injectate stream. Well component materials will be selected using standard engineering specifications for specific functions with a balance between engineering serviceability and economics.

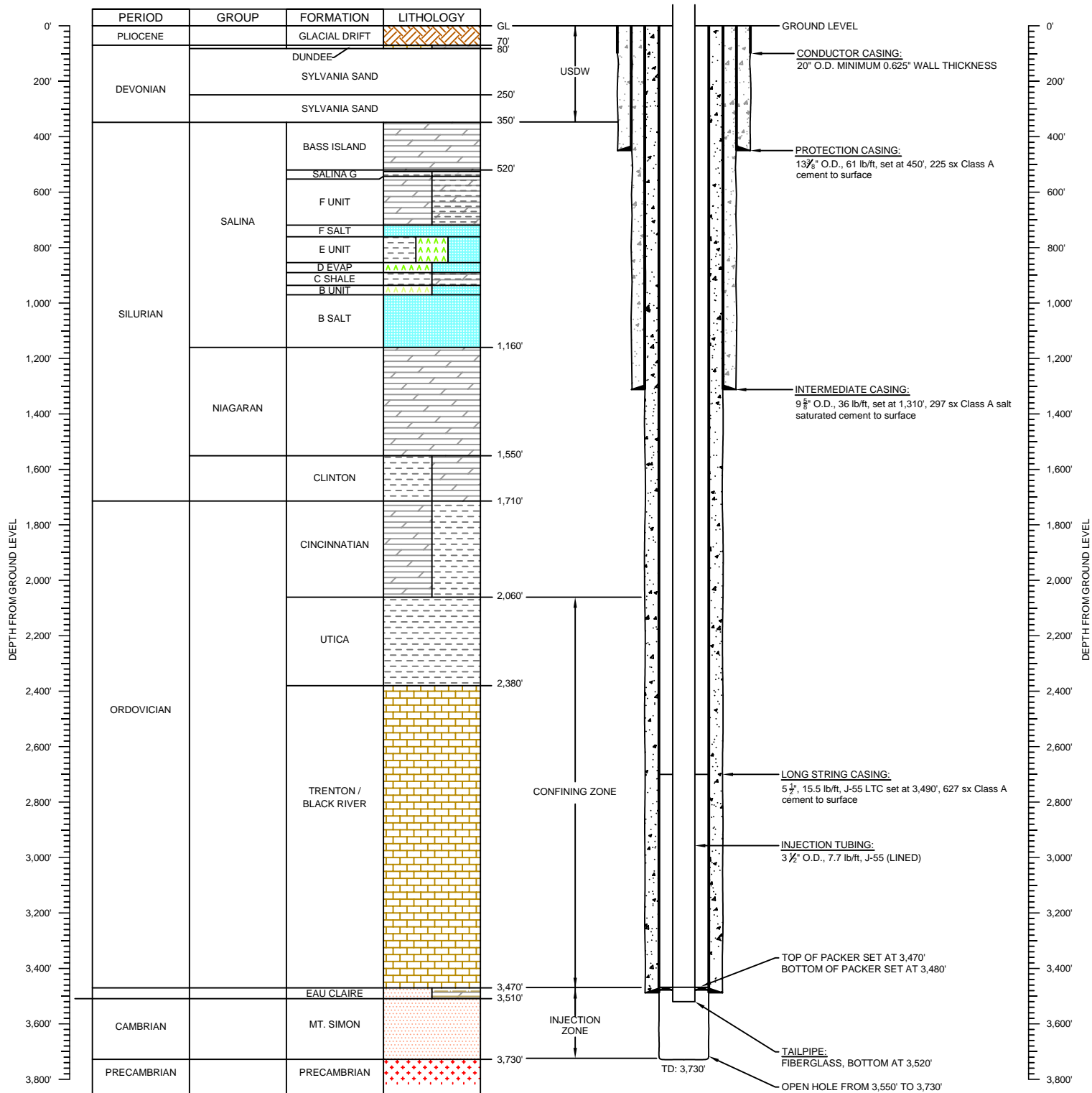
Table H-2 Estimated Wastestream Analysis for Proposed Monitored Parameters

PARAMETER	UNITS	READING
pH		7.24
Resistivity	ohm-meter	0.046
Temperature	°F	70
ANIONS		
Chlorides	mg/L	193,000
Sulfates	mg/L	2,989
Sulfides	mg/L	ND < 1
Carbonates	mg/L	ND < 10
Bicarbonates	mg/L	150
CATIONS		
Sodium	mg/L	112,500
Calcium	mg/L	1,940
Magnesium	mg/L	199
Barium	mg/L	ND < 1
Iron (total)	mg/L	ND < 1

Notes:

Mg/L – milligram per liter

ND – not detected



Legend

	Dolomite		Sandstone		Siltstone/Dolomite
	Limestone		Shale		Unconsolidated
	Salt		Anhydrite		



WSP USA Inc.
8212 Kelwood Ave.
Baton Rouge, LA 70806
TEL: (225) 753-2561
FAX: (225) 925-2530

BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

PROPOSED BDW-1 WELL CONSTRUCTION AND STRATIGRAPHY

Job No. 192065B

Design: WDD

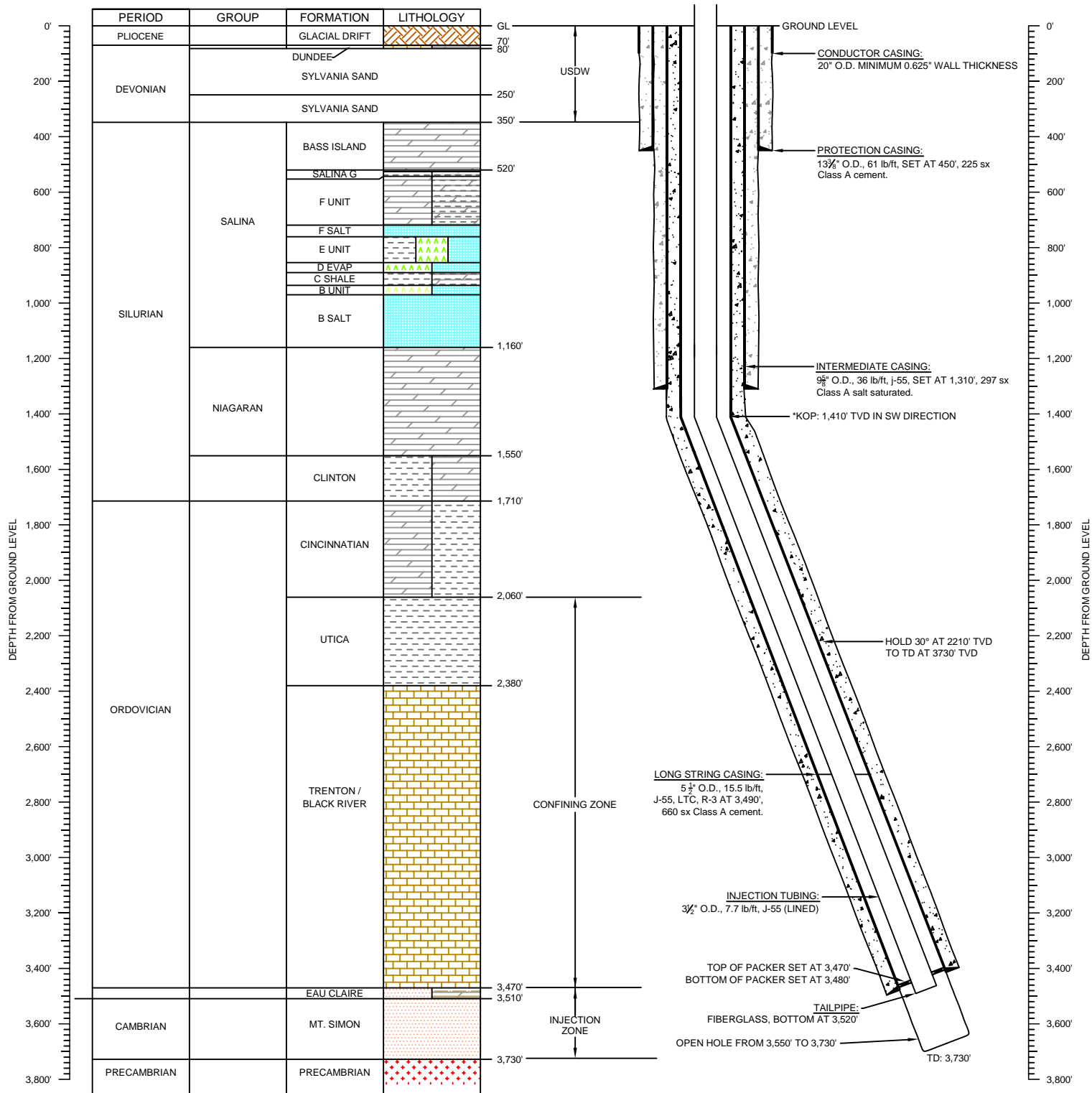
Checked: PP

Approved: GEM

Date: 10/29/18

Scale: NTS

Figure No. M-1



NOTE: KOP will be 50 feet below bottom of salt



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8212 Kelwood Ave.
Baton Rouge, LA 70806
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FAX: (225) 925-2530

BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

PROPOSED BDW-2 WELL CONSTRUCTION AND STRATIGRAPHY

Job No. 192065B

Design: WDD

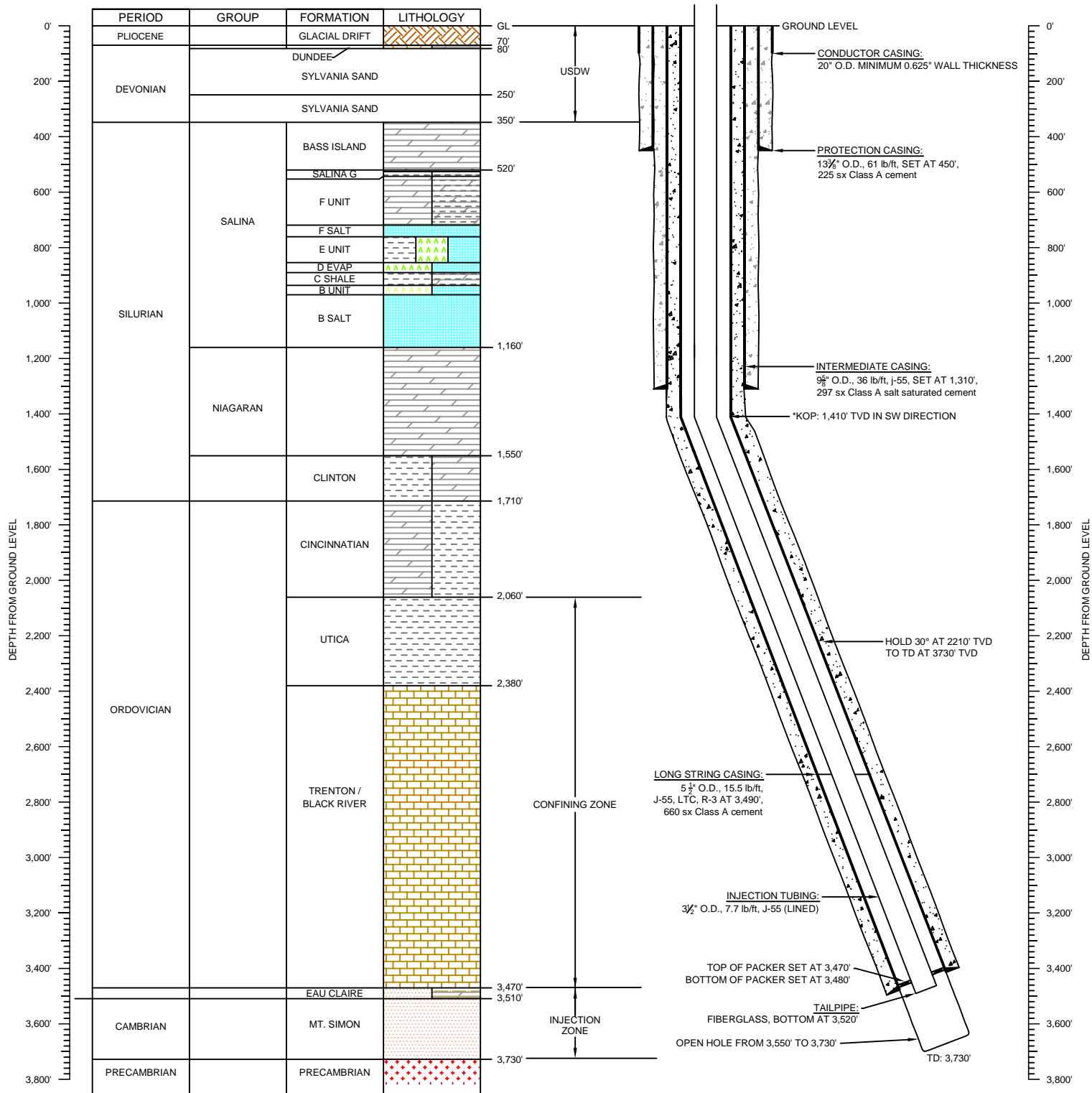
Checked: PP

Approved: GEM

Date: 10/29/18

Scale: NTS

Figure No. M-2



Legend

	Dolomite		Sandstone		Siltstone/Dolomite
	Limestone		Shale		Unconsolidated
	Salt		Anhydrite		

NOTE: KOP will be 50 feet below bottom of salt



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BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

PROPOSED BDW-3 WELL CONSTRUCTION AND STRATIGRAPHY

Job No. 192065B

Design: WDD

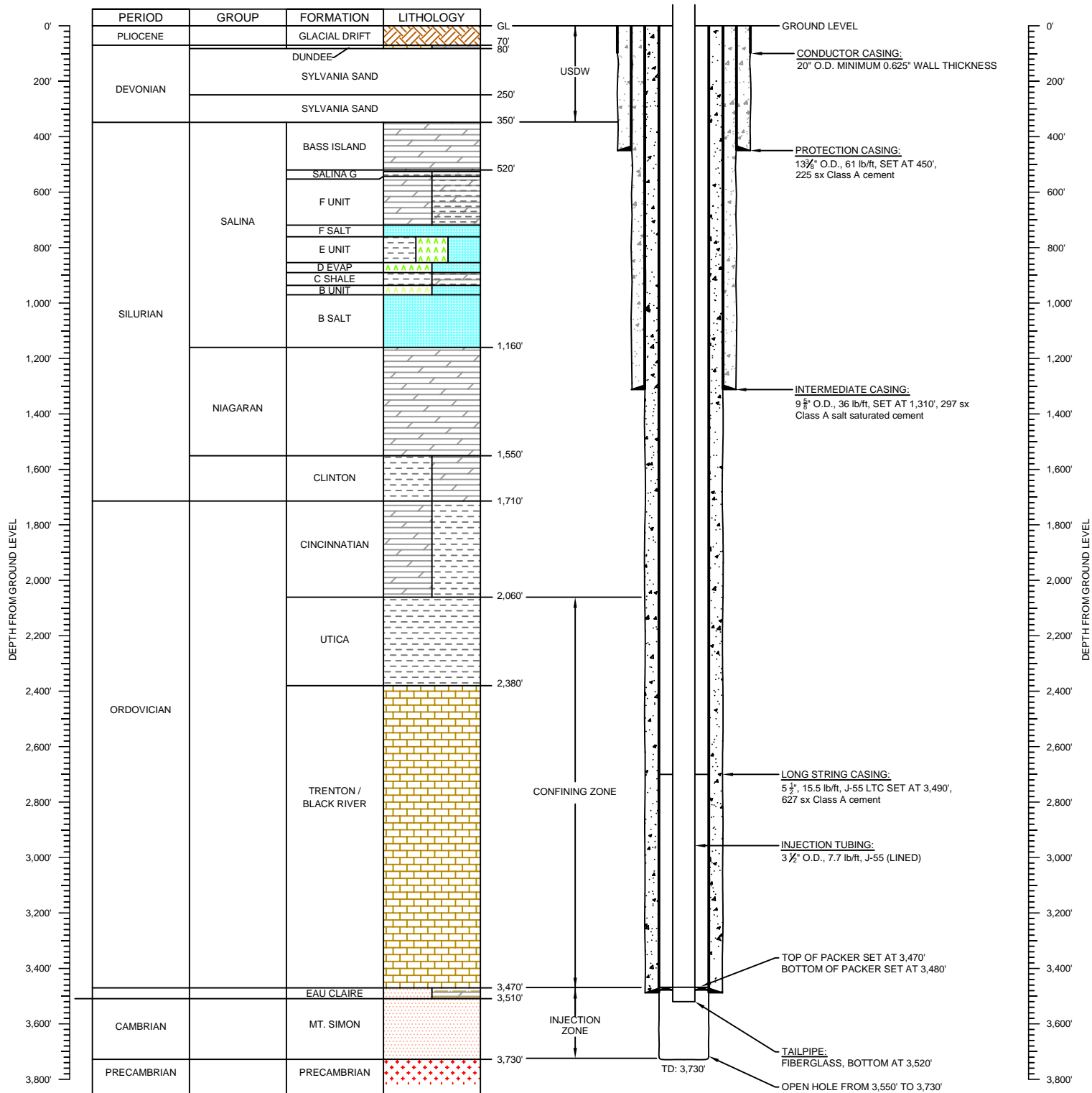
Checked: PP

Approved: GEM

Date: 08/21/17

Scale: NTS

Figure No. M-3



Legend

	Dolomite		Sandstone		Siltstone/Dolomite
	Limestone		Shale		Unconsolidated
	Salt		Anhydrite		



WSP USA Inc.
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BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

PROPOSED BDW-4 WELL CONSTRUCTION AND STRATIGRAPHY

Job No. 192065B

Design: WDD

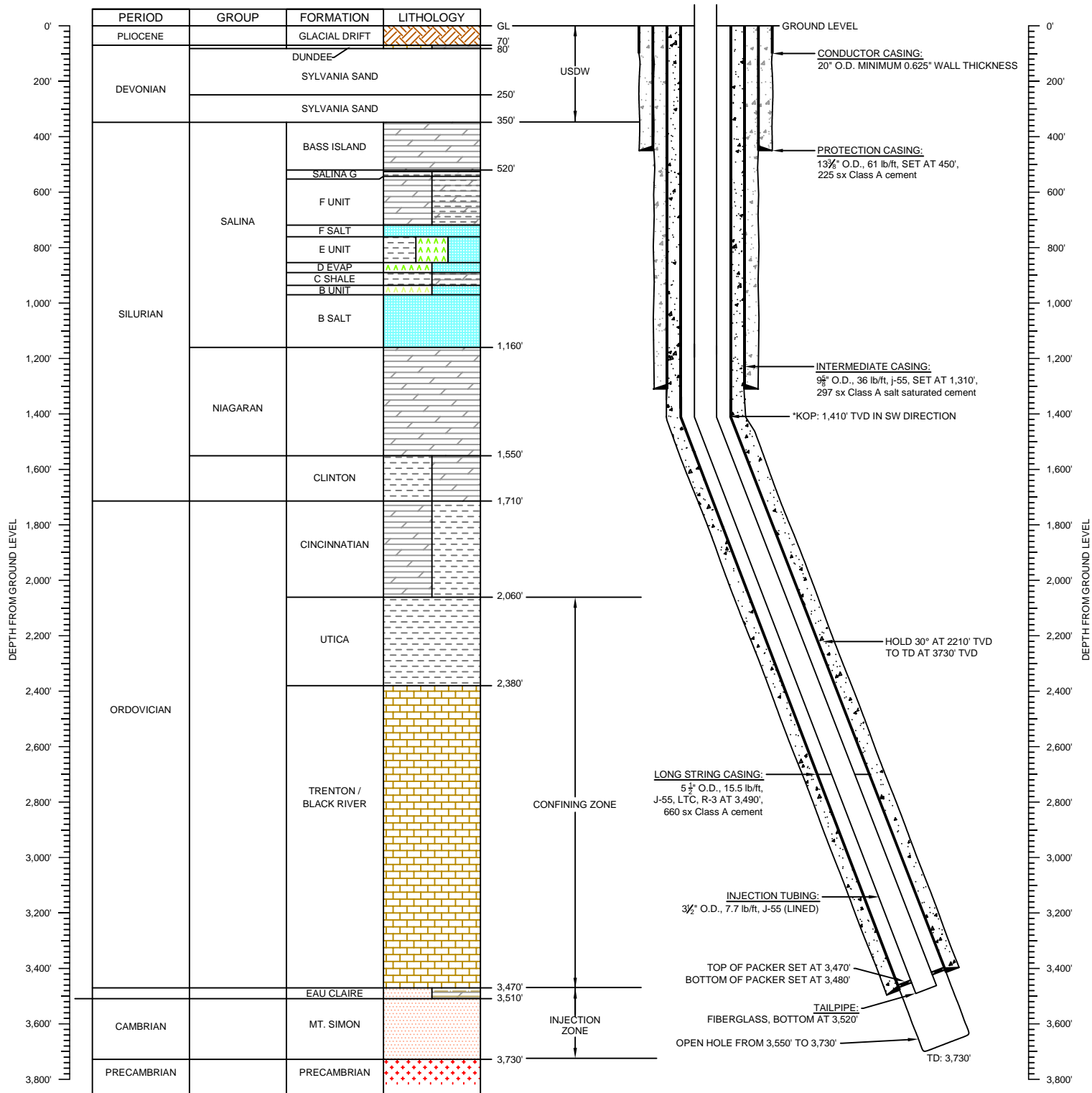
Checked: PP

Approved: GEM

Date: 08/21/17

Scale: NTS

Figure No. M-4



Legend

	Dolomite		Sandstone		Siltstone/Dolomite
	Limestone		Shale		Unconsolidated
	Salt		Anhydrite		

NOTE: KOP will be 50 feet below bottom of salt



WSP USA Inc.
8212 Kelwood Ave.
Baton Rouge, LA 70806
TEL: (225) 753-2561
FAX: (225) 925-2530

BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

PROPOSED BDW-5 WELL CONSTRUCTION AND STRATIGRAPHY

Job No. 192065B

Design: WDD

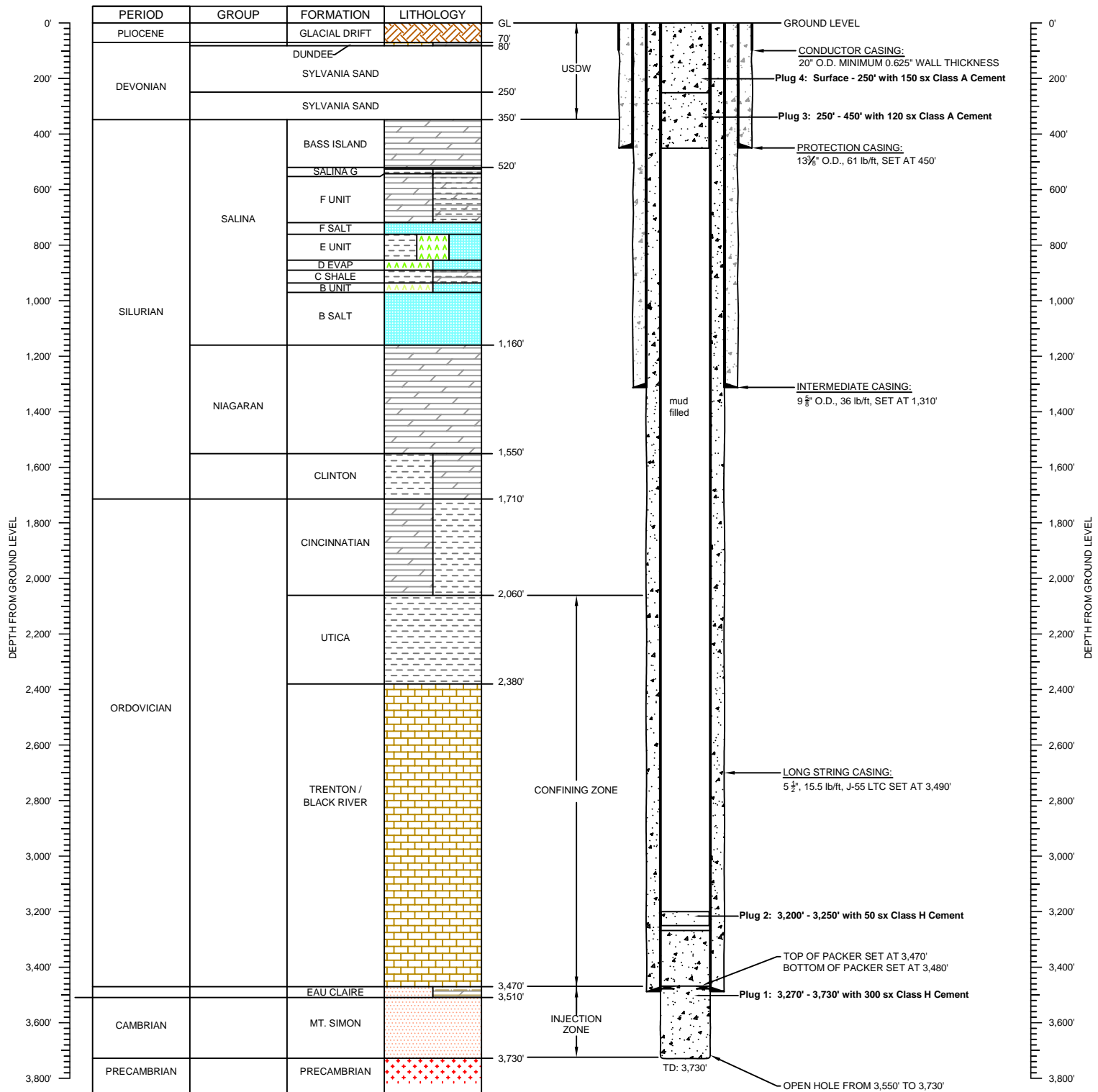
Checked: PP

Approved: GEM

Date: 08/21/17

Scale: NTS

Figure No. M-5



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BUCKEYE TERMINALS, LLC
WOODHAVEN TERMINAL
WAYNE COUNTY, MICHIGAN

PROPOSED VERTICAL PLUGGING & ABANDONMENT SCHEMATIC

Job No. 192065B

Design: WDD

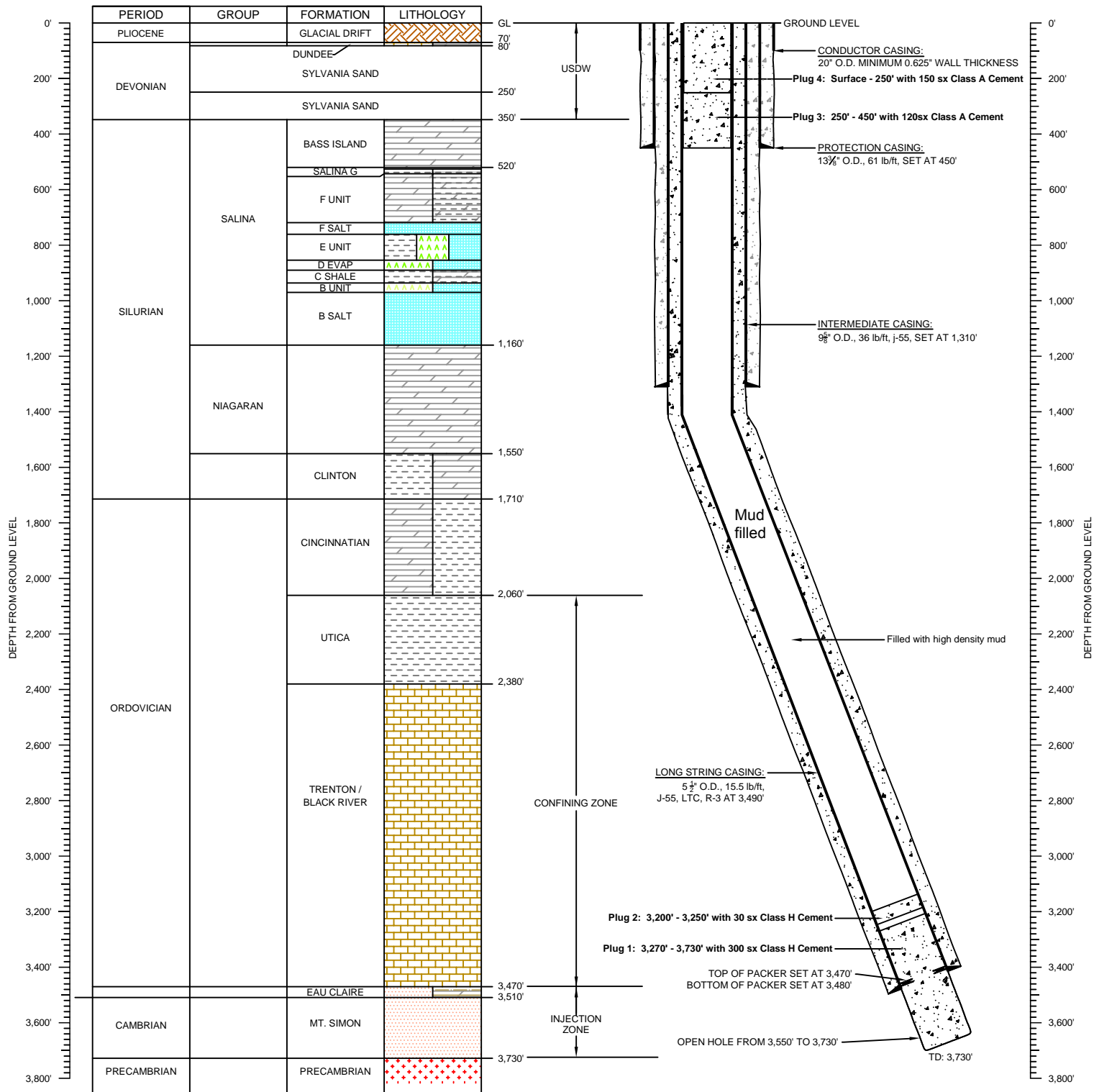
Checked: PP

Approved: GEM

Date: 10/29/18

Scale: NTS

Figure No. Q-1



NOTE: KOP will be 50 feet below bottom of salt



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BUCKEYE TERMINALS, LLC
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WAYNE COUNTY, MICHIGAN

PROPOSED DIRECTIONAL PLUGGING & ABANDONMENT SCHEMATIC

Job No. 192065B

Drawn: WDD

Checked: PP

Approved: GEM

Date: 10/29/18

Scale: NTS

Figure No. Q-2